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PATENT SPECIFICATION



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COMPLETE SPECIFICATION

Improvements in or relating to the production of Edible Products from Gluten-containing Flour

I, HANS FERDINAND BAUER, of 1218, Winona Street, Chicago, Illinois, United States of America, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to methods for making edible products in which a flour is used. Such products may be either of a yeast leavened or chemically aerated nature similar to breads, cakes, biscuits and other like substances. More particularly, this invention relates to processes for making edible products comprising the treatment of a gluten-containing flour used as a component of such edible products for the purpose of so modifying the gluten content as to facilitate or expedite the subsequent steps in the process of manufacture.

Previously there have been several disadvantages in the utilization of gluten-containing flours, particularly in making edible products. These disadvantages have been found to be inherent in the characteristic of flour itself inasmuch as such disadvantages may be traced back to the relative toughness or lack of tensibility of the dough when formed from gluten-containing flours. That this characteristic toughness of the dough so formed from ordinary flours is one of primary influence in the making of such products can be appreciated when it is realized that the porosity essential to the final product is due to the formation or expansion of gas within the dough or batter generated by a leavening agent such as yeast or a chemical aerating agent such as baking powder. The dough if it is tough and relatively non-tensile is more resistant to an increase in porosity inasmuch as the gases generated within the material are restrained from expanding. There is also the related disadvantage that the toughness of the dough or batter tends to allow an uneven expansion of the gases with resulting uneven porosity in the final product.

A previously available method to over-

come these disadvantages has been to carry on a considerable working of the dough or batter to obtain an even distribution of the gases and to allow a long period of time for their generation and expansion. In using certain agents for increasing the porosity of the dough, for example, yeast, there may be brought into operation after a period of time a mellowing action upon the gluten but this condition only arises, as already stated, after a considerable period of time has elapsed and only by a careful control of the operating conditions and proper working of the dough.

There are other attendant disadvantages which derive from the same source. Due to the fact that previously a relatively long period of processing has been necessary in obtaining a dough or batter of desirable properties, there takes place a chemical deterioration of the flour, which deterioration may result in compounds being formed which have an unpleasant or at least negative taste. Also there has been a considerable loss of reaction products during these operations, some of which result in diminishing the ultimate yield from a given amount of starting materials and which also results in losses of desirable constituents from the final product. This is particularly true in connection with the loss of the fermentation products resulting in making a leavened dough with yeast.

According to the present invention there is provided a process for improving gluten-containing flour comprising mixing with said flour 1% to 7% of flour previously treated with a member of the group consisting of sulphur dioxide, sulphurous acid, sodium bisulphite, sodium meta-bisulphite, sodium pyrosulphite, sodium hydrosulphite, organic addition compounds of sodium hydrosulphite with aldehydes and ketones, and sodium sulphite in an amount not more than the equivalent in gluten softening properties of 1% of sodium sulphite, whereby the gluten content of the entire flour mixture becomes softened.

A flour so treated when mixed with water to form a dough or batter will form

a dough which is more mellow, more tensile and more capable of being thoroughly and more uniformly aerated than it is possible to obtain in making a 5 dough from ordinary untreated flour. It enables edible products to be produced without the necessity of extended working, such products having a uniform porosity and highly desirable characteristics in 10 view of the fact that they have in them components which would be lost or would deteriorate during extended dough-forming operations. The products are also free from unpleasant tasting constituents 15 with the result that the true flavours of the various flours used are brought out.

It may be pointed out that in the making of a product, for example, of the type of bread, there are two general 20 methods used for the preparation of a dough in which yeast is used as the leavening agent. These two methods are namely, sponge dough method and straight dough method. In the sponge dough 25 method the yeast is mixed with a part of the flour and allowed to ferment before the balance of the dough is added to it, whereas in the straight dough, the entire batch of dough is made up and allowed 30 to ferment. After the complete dough batch has been made, the methods used in further processing have been substantially 35 the same and are familiar to those skilled in the art. These subsequent steps consist primarily in allowing the ferment to act within the dough, separating the dough into desired units and baking them. However, the difficulties of carrying out 40 these operations previously have been considerable and have necessitated a number of intermediate operations with considerable pounding and working of the dough and a great amount of handling from one machine to another. This procedure has 45 furthermore necessitated considerable special equipment.

One of the primary reasons for the necessity of all of the prior processing which was formerly believed to be necessary in making a bread type of product 50 from a dough fermented with yeast has been the toughness or non-tensibility of the dough. The previous processing steps were carried out to overcome this difficulty and to soften the dough by the working and fermenting action which eventually brought about an extensibility which permitted the production of a product which approached one of uniform porosity.

60 In the making of products from a batter utilizing a chemical aerating agent, the same difficulties have arisen, and in order to obtain satisfactory results, it was necessary to use sufficient gas forming 65 aerating components to overcome the rela-

tive toughness of the batter due to the gluten constituents of the flour used.

By means of the present method one is able to so soften the gluten constituents of the flour used by preliminary treatment 70 that the disadvantages enumerated above, due to the dough and non-tensile character of the dough, are avoided and a soft extensible readily resilient dough is obtained which permits a quick and rapid processing and the formation of edible products which are unique in both physical and chemical characteristics. The amount of gluten modifying agent of the type enumerated above utilized in carrying out this process is so small, and furthermore is usually eliminated from the dough or edible product during subsequent processing operations that it is substantially undetectable in the final products. Should, however, any of these chemical 80 components be found to be present, the amount would be so small as to have no effect upon the human system, and are well within the limits allowed by the pure food laws.

85 The dough softening operations in making edible products are carried out in the manner now to be described. A small amount of one or more of the gluten modifying substances is blended with only a portion of the flour to be used and such treated portion is mixed with untreated flour and the mixture used in making up the dough. The flour thus 90 prepared is then made into the dough or batter, and upon wetting, mixing and working of the same, the modifying or mellowing effect comes into effective 95 action upon the gluten of the flour and 100 a soft, extensible and easily workable dough or batter is obtained. The subsequent operations in using such a modified dough or batter may be the same as those which are usually carried out by persons 105 skilled in the baking art. Due to the fact that the effectiveness of the various gluten modifying chemicals mentioned vary to quite an extent and also the gluten content of flours, and that it is desirable to 110 use a minimum quantity of such a gluten modifying agent so that its presence will not affect the product in such a way as to make it undesirable for food purposes, one may use in the preferred form of 115 this process sulphur dioxide or sodium bisulphite to accomplish this purpose. These last mentioned chemicals are generally effective in producing the desired effect on the dough when used in 120 quantities of less than 0.00075 per cent. to the total amount of flour used.

125 An effective application of this method of mellowing the gluten content of flours from the standpoint of the flour miller, 130

would be to treat a flour in the dry state with a sufficient amount of gaseous sulphur dioxide to obtain the desired degree of softening action on the gluten, and subsequently heat or agitate the treated flour to a degree sufficient to drive off any non-absorbed sulphur dioxide that might remain in a free state. This modified flour is used as described above, namely, a portion of such modified or treated flour sufficient to obtain the desired degree of mellowing action, is mixed with untreated flour in making up a dough. For example, by the treatment of 15 5000 parts of wheat flour in the dry state with one part by weight of gaseous sulphur dioxide, and subsequently agitating the flour for one hour at a temperature of 230° F. to remove any non-absorbed sulphur dioxide, there can be obtained a modified flour product which, when added in proportions of from 1 to 7% to an untreated flour, will mellow the gluten of that flour to a degree suitable for this 25 purpose. The exact percentage or proportion of this treated flour product to be added to the untreated flour depends on the type of flour used, and the purpose for which it is to be applied. As a general rule, it is desirable for best results to use a greater percentage of the modified flour product in conjunction with clear or long patent flours of high gluten content than would be necessary with extra short patent 30 flours of lower and softer gluten content. In this connection it is effective to treat a portion of some protein containing vegetable flour, such as soy bean flour, pea flour, potato flour, and other similar 35 flours with sulphur dioxide, and subsequently heating and agitating to remove any remaining free sulphur dioxide. Such a conditioned vegetable flour is then mixed with a wheat flour, for example, in the 40 proportions of 1 to 7 parts treated vegetable flour to 100 parts of wheat flour in producing a desirable extensible dough. Another preferred method for mellowing the gluten content of flour would be 45 to blend for example, 1 lb. of sodium bisulphite with 1000 lbs. of the flour or material to be treated, for example, wheat flour, rye flour, corn flour, or starch, and then acidify the mixture with an excess of hydrochloric or similar acid required to react with the sulphite salt present. Sulphur dioxide and the salt corresponding to the acid used are the products of the 50 reaction. Subsequently, the mixture is heated in a dextrine converting drum until any non-absorbed sulphur dioxide is driven off, and the starch components of the material are partially dextrinized. Amounts up to the equivalent of 1% of 55 sodium sulphite may be used in accord- 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130

ance with the above described method, and equivalent amounts (in sulphur dioxide content) of the other named gluten modifying substances may be used. The final product obtained in this way is then added to the main portion of the flour to be used in preparing the dough or batter within the limits stated above, the proportions depending upon the degree of gluten modification desired.

One of the very noticeable effects obtained through the use of this invention is the reduction of mixing time. If, for example, a baker finds it necessary to mix a certain flour 15 minutes in order to obtain a smooth dough, he will find that on the use of the preferred portion of the flour treated as described, the necessary mixing time required to obtain a smooth silky dough will be reduced to possibly 9 or 10 minutes, the amount of reduction depending on the proportion of the modifying agent added, or the proportion of the treated flour used.

By means of this process one is able to considerably cut down the amount of time necessary to form a dough or batter and simultaneously eliminate many of the operations which have previously been necessary. The dough which is formed is of such a soft and extensible nature that it rises rapidly. It is also possible to obtain a final product which has a uniform and even porosity of fine multi-cellular characteristics. Products which have not changed in natural flavors of the cereal materials originally added can now be obtained. By means of the operation of conditioning, softening or mellowing the gluten content of the flours used, either in yeast leavened or in chemical aerated food products, the flour is therefore made capable of a thorough and more uniform aeration and made up into a dough in a relatively short period of time as compared with previous operations.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. The process for improving gluten-containing flour comprising mixing with said flour approximately 1% to 7% of a flour previously treated with a member of the group consisting of sulphur dioxide, sulphurous acid, sodium bisulphite, sodium meta-bisulphite, sodium pyrosulphite, sodium hydrosulphite, organic addition compounds of sodium hydrosulphite with aldehydes and ketones, and sodium sulphite in an amount not more than the equivalent in gluten softening properties of 1% of sodium sulphite, 130

whereby the gluten content of the entire flour mixture becomes softened.

2. The process as set forth in Claim 1 in which the preliminarily treated flour is heated to remove any of the resulting non-absorbed treating compound and to partially dextrinize the starchy components of the flour.

3. The process as set forth in Claim 1, 10 the treating compound being a sulphite salt, the mixture of the flour and sulphite

salt being acidified with an excess of acid to react with said sulphite salt, and the mixture being heated to remove any resulting non-absorbed sulphur dioxide and 15 to partially dextrinize the starchy components of the flour.

Dated this 16th day of February, 1938.

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